

[0054] Applying such access control in sequence is easier because the type of the application is known in the application layer and, except for Service-Specific-Access-Control (SSAC), the barring parameters are handled in a modem. The modem and application layer are individual modules. Therefore, by using ordered lists, embodiments of the present invention allow for more control over which applications are prioritized, and embodiments of the present invention do not require complex interaction between AS/NAS/Application layers. Relaying the parameters from AS to application layer may be performed in the same way as is done for SSAC. Embodiments of the present invention are directed to rules, which govern, in a congestion situation, how the barring parameters are applied, and how they interwork with the existing barring mechanisms. In addition, for RRC_CONNECTED UEs, the network may also specifically determine some UEs which should or should not utilize the indications, which may cater to different user profiles.

[0055] In one embodiment, an evolved Node B (eNB) may transmit/broadcast barring parameters relating to one or more application groups. Each application group may include one or more application. The barring parameters may be applied in the order that they are signalled by the eNB. The barring parameters may indicate which application require an access-barring check. The eNB may also indicate whether the barring of certain application groups is currently active.

[0056] The amount of application groups and the manner of mapping application groups to the barring parameters may be defined in an application layer and/or an operating-system (OS) layer. The barring parameters may be mapped to the application groups in the Radio-Resource Control (RRC) layer. The amount of groups and the manner of mapping the barring parameters to the application groups in the RRC layer may also be defined in the adaptation layer between a modem and an operating system (OS).

[0057] According to embodiments of the present invention, 3GPP may define a plurality of application groups for which the barring parameters are applicable. For example, a first group (hereinafter referred to as “group 1”) may correspond to a group of applications to be prioritized during an emergency situation. A second group (hereinafter referred to as “group 2”) may correspond to a group of applications to be prioritized during a non-emergency situation (such as a social event, for example). RRC signalling may then be used to broadcast the barring parameters corresponding to each of the groups.

[0058] FIG. 1 illustrates a UE using barring parameters in accordance with one embodiment. Referring to FIG. 1, a UE 100 may receive the barring parameters for group 1 from a network. The UE 100 may then forward these received barring parameters to an application (AP) layer. The barring parameters may be forwarded to the AP layer in the same manner as how Service-Specific-Access-Control (SSAC) parameters are forwarded from the AS to the Non-access Stratum (NAS) to the AP layer. In the AP layer, only applications belonging to group 1 may bypass the barring parameters, and the other applications which do not belong to group 1 should be subjected to a barring check in accordance with the barring parameters. If an application is barred after the barring check, the UE cannot initiate that barred application (like with any other barring mechanism). Otherwise, the UE may continue to make the connection to use that application. In another embodiment, a network may

broadcast barring parameters for group 1 and group 2. When a UE receives the broadcast barring parameters, the UE may forward the barring parameters to an application layer and then apply the barring parameters for both group 1 and group 2 applications. Embodiments of the present invention also define the interaction among the barring parameters for group 1 and group 2. In one embodiment, group 1 may be defined as having priority over group 2. For example, applications corresponding to group 1 may be considered to be more important than the applications of other groups, and group 2 may correspond to applications which operators want to prioritize if a network is congested due to the heavy-traffic load (for example, heavy traffic during social events).

[0059] Embodiments of the present invention may direct the interaction between the barring parameters for group 1 and group 2.

[0060] In one embodiment, an eNB may be allowed to only broadcast barring parameters for a single application group. For example, if there are two application groups, the eNB may broadcast only barring parameters for group 1 or for group 2, but not for both groups.

[0061] In another embodiment, the eNB may be allowed to broadcast parameters for multiple groups. The order in which the eNB broadcasts the parameters may signify how the parameters are to be applied. For example, the order in which the parameters are broadcasted may determine the priority of the parameters. For example, if the parameters of group 1 are broadcasted first by the eNB, the applications of group 1 may be more important than the applications of group 2. The importance of the applications in a group may decrease as the numerical order of the corresponding transmitted parameter-group increases. The UE may first apply the first priority barring parameter before considering a lower-priority barring parameter.

[0062] To further illustrate embodiments of the present invention, consider the following example cases. In a first example case, suppose an application belongs to group 2 but the application does not belong to group 1. When the application causes the UE to attempt to access the network, the UE first checks the application against barring according to the parameters for group 1, and, if the application does not pass the barring check based on group 1 parameters, the UE cannot make the connection for a certain duration. If the UE passes the previous first barring check, the UE then checks the group 2 access parameters. If the application belongs to group 2, the UE is allowed to bypass the barring parameters of group 2 and is then allowed to start to access the network for this application.

[0063] In a second example case, suppose an application belongs to neither group 1 nor group 2. In this case, both barring checks are applied. First, the UE checks whether the application is barred according to group 1 parameters and then checks barring based on group 2 parameters. If the UE passes both barring checks with both barring parameters, the UE is then allowed to try to start to access the network for this application.

[0064] In a third example case, suppose an application belongs to group 1. In this case, barring parameters for group 1 and group 2 are both ignored, and the UE is allowed to access the network for this application. The group 2 conditions need not be checked because group 1 already allows the application.